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(56) Documents Cited
GB 1316950 A US 5347186 A US 4709176 A

(58) Field of Search
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(54) Device for generating electricity from vibrations

(57) A device for producing electricity from vibrational energy, comprises a housing (4), a coil (24) arranged within the housing (4), a pair of permanent magnets (3,5) arranged within the housing, and resilient mounting means (30,32) supporting the coil (24), whereby vibration of the housing (4) causes relative movement between the coil and magnet thereby generating an emf.

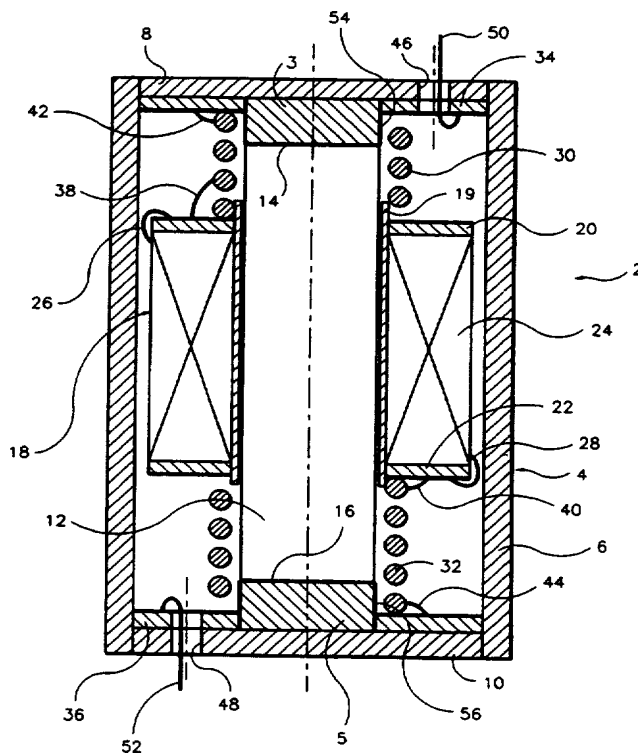


Fig. 1

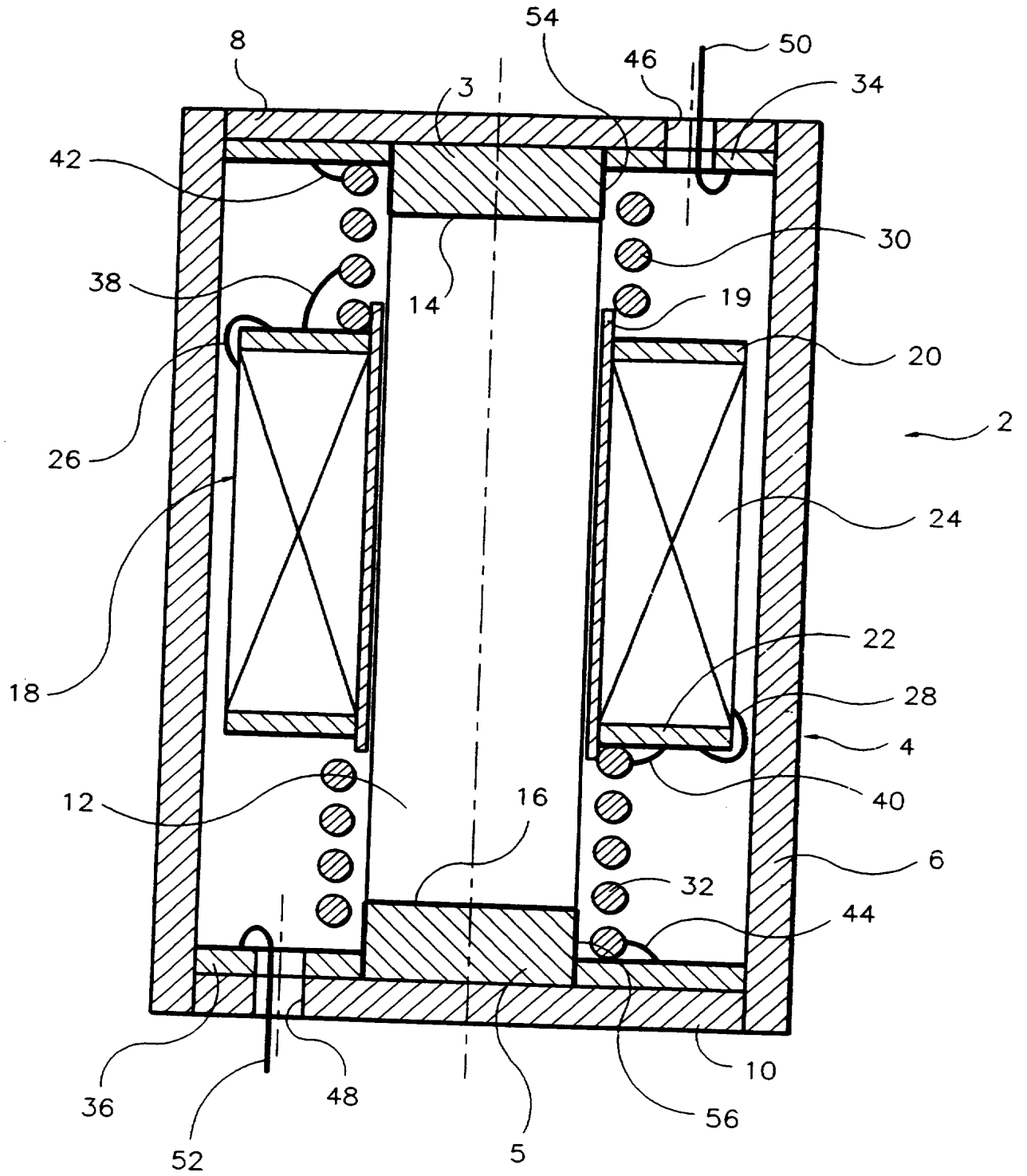


Fig. 1

DEVICE FOR GENERATING ELECTRICITY FROM VIBRATIONS

The present invention relates to a device for generating electricity from vibrational energy.

5 As global demands on the world's energy resources increase, it becomes increasingly necessary to conserve those resources, and in particular, to find and utilise renewable energy sources or to increase the efficiency of use of existing resources.

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The present invention seeks to provide a device which produces electricity from vibrational energy. In a wide variety of situations such energy would be dissipated into the environment, generally as heat, and thereby wasted.

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According to the present invention there is provided a device for producing electricity from vibrational energy, comprising:-

a housing;

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a coil arranged within the housing;

at least one permanent magnet arranged within the housing; and

resilient mounting means supporting one of the coil or the magnet, whereby vibration of the housing causes relative movement between the coil and magnet thereby

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generating an emf.

5 This simple arrangement provides a source of electrical power when the device is carried by or fixed to a vibrating object.

Preferably, the magnet is fixed within the housing, and the coil is movably mounted on said resilient means. The resilient means comprise at least one coil spring.

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Preferably the coil spring is formed of electrically conductive material, and the coil is electrically connected to an external electrical connection via the coil spring.

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In the preferred embodiment the coil is supported between a pair of said coil springs, with electrical connection to opposite ends of the electrical coil through respective coil springs.

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The device may be used in combination with a bicycle or vehicle lamp as a warning light. The device may also be used as a vehicle battery charger.

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An embodiment of the present invention is now described, by way of example only, with reference to the following drawing in which:-

Figure 1 is a sectional view through the device in accordance with an embodiment of the invention.

Turning to the single drawing, this shows in section the device indicated generally by 2 for generating electricity from vibrations. This has a generally cylindrical housing 4 having a side wall 6 and end walls 8, 10. The side wall 6 and end walls 8, 10 are formed of magnetically soft material, preferably ferrous material. At each end wall 8, 10 there is disposed a permanent magnet indicated 3, 5 respectively with an axially-extending pillar 12 comprising a ferrous tube extending between the magnets. Insulating layers 14, 16 formed of an electrically insulating material such as insulating paint are disposed between the central pillar 12 and permanent magnets 3, 5. The pillar 12 supports a coil assembly 18 which comprises a central tubular element or sleeve 19 of electrically insulative material having arranged at opposite ends thereof a pair of flange-like plates 20, 22 fixed to the pillar 12. These may be fixed simply using an adhesive. These are clad on the axially outer surfaces with an electrically conductive material such as copper. Between the plates 20, 22 is wound a wire coil 24 comprising a large number of wire turns. Each end of the coil 24 is connected to the respective copper surface of the plates 20, 22. The end regions of the coil are shown in Figure 1 where they are

connected to the copper-clad plates 20, 22 are indicated by numerals 26, 28.

5 A pair of coil springs 30, 32 are disposed between each
respective end plate 8, 10 and the copper-clad face of
plates 20, 22. At the ends adjacent the end plates 8, 10
the coil springs abut washer-like plates 34, 36 which are
also each clad on one face by a conductive material such as
copper, with this face facing towards the coil springs.
10 The coil springs are also made of an electrically
conductive material, so that electrical connection is made
between the plates 20, 22 and the plates 34, 36 through the
coil springs. Wire connections 38, 40, 42 and 44 comprise
lengths of wire soldered at opposite ends which serve to
15 limit excessive movement of the coil springs and of the
wire coil 24.

Apertures 46, 48 in the end plates 8, 10 and plates 34, 36
are provided, through which extend the output leads 50, 52
20 for connection to a power load or storage battery.
Numerals 54 and 56 denote tubular layers of insulative
material provided in order to electrically isolate the
magnets from the electric circuit. These may be formed of
plastics material.

25 In use, the device 2 is carried by or fixed to a vibrating

object. Vibrations will cause movement of the coil assembly 18 relative to the rest of the housing, since the coil assembly is not rigidly supported but is resiliently supported. As the coil assembly 18 moves relative to the rest of the housing, the wire coils which are disposed in the magnetic field of the permanent magnets will cut the magnetic flux lines of the magnets 3, 5 thereby generating an emf between the output leads 50, 52.

In an alternative arrangement the wire coils may be fixed within the housing and the magnets resiliently mounted within the housing so that these move relative to the wire coils.

Appropriate selection of the mass of the coil assembly and the spring constant of the coil springs allow the degree of movement of the wire coils relative to the magnets to be maximised for a particular vibrational source in order to maximise the electricity production. As an example, a device of about 13mm diameter and 48mm height can with appropriate vibration generate a current of about 5mA.

The device finds particular applications in situations where a low power consumption is required and a constant source of vibrations available; for example, in many forms of transport vibrations are generated, and these can be

used to power items such as lighting. Particular examples are warning lights for use at night on vehicles and bicycles. The device can even be used to harness vibrations produced by someone walking or running, for example to power a small safety light in order to make a runner more visible in the dark. Larger devices can be used to as battery charges for motor vehicles.

CLAIMS

1. A device for producing electricity from vibrational energy, comprising:-

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a housing;

a coil arranged within the housing;

at least one permanent magnet arranged within the housing; and

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resilient mounting means supporting one of the coil or the magnet, whereby vibration of the housing causes relative movement between the coil and magnet thereby generating an emf.

2. A device according to claim 1 wherein the magnet is fixed within the housing, and the coil is movably mounted by said resilient means.

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3. A device according to claim 1 or 2 wherein said resilient means comprises at least one coil spring.

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4. A device according to claim 3 wherein the coil spring is formed of electrically conductive material, and wherein the coil is electrically connected to an external electrical connection via the coil spring.

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5. A device according to claim 4 wherein the coil is

supported between a pair of said coil springs, with electrical connection to opposite ends of the coil through respective coil springs.

5 6. A device as claimed in any preceding claim in combination with a bicycle lamp.

7. A device as claimed in any one of claims 1 to 6 in combination with a vehicle lamp.

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8. A device as claimed in any one of claims 1 to 6 in combination with a vehicle battery.

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9. A device substantially as hereinbefore described and as illustrated in the accompanying drawing.



Application No: GB 9605505.8
Claims searched: 1-9

Examiner: John Cockitt
Date of search: 29 January 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.O): H2A [AKR7]
Int Cl (Ed.6): H02K [35/02, 35/04]
Other: ONLINE: EDOC, WPIL; OPTICS [H2A (AK217* + AK104 + AK120)]

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB1316950A UNIVERSITY - see whole document	1-4,6-9
X	US5347186A McQ - see whole document	1,6-9
X	US4709176A RIDLEY - see whole document	1,3,6-9

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.